THE RECOVERY AND THE PRESERVATION OF THE ENERGY OF THE WATER SUPPLY SYSTEMS IN KISHINEV FROM REPUBLIC MOLDOVA

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SUMMARY: *On the basis of the modern methods of research, measure the parameters and the remaking of the date with the application of performance methods for the optimization operation of the pump stations on watery meshes is presented result of the efficiency of technical-economical modernization to different pump stations from RM. The main ways are to make to work operation of the units of pumps to different regimes in the diapason thing except with high efficaciousness through traditional methods as the turning impellers of the pumps and their variation of rev through the introduction converters of frequent current to the electromotor with operation in automatic regime from transcribers of flows, pressure, level and can. Some possibility of preserve the energy is can produced used the existing equipment to operation in at the some time and in serial, the use waves is can the regime of thing of the pipelines of guys soda. In the case when are pipelines below gravitation the waterpower is can retrieved through the redress directly the water below pressure to consummator, and fill basins existences for adjustment and fire is produced through pumps, as with of a help hydraulic which changer can raise the pressure in the waterworks till to what necessary. All these proposals realized have reduced the consumption of energy to the pumping of the water of the system with a third.*

Keywords: Pumping system, centrifugal pump, hydraulic gird, characteristic curves, efficiency optimisation.

1. Introduction.

The principal river intake, supplying raw water to the OVS (water treatment works) in Kishinev by means of the three pumping stations, was constructed 1972.The intake works are located at Vadul lui Voda, some 20 kilometers to the northeast of Kishinev. The abstracts water from River Dniester. From the intake, raw water is pumped through a series of large diameter trunk mains, some 17,2 km in length to OVS. In addition to the pumps at the river intake (known as pomping station 1) there are two intermediate
pomping stations 2 and 2a close to the Dniestr water treatment plant, and within 2,4 km
of the intake. Generally, the raw water pumps at each station are sized at 6300 m3/hour (regim 1), with smaller units at station 1, 2 and 2a pumps flow sized at 3200m3/hour, to
provide some flexibility. All motors and switch-gear have a 6000 volt high voltage supply. The four 1600kW pumps are the original units as installed in PS1 and PS2, 2a as installed houses three 1600kW plus two 800 kW units. They are of

the horizontal spindle split casing, centrifugal design with fixed speed motors. In order to revise the tender documents to accommodate actual documented conditions, testing of flow, pressure and consumption was carried out based on the methodology which was worked out by author and approved by the Apa Canal Chisinau, fig.1.

2. Application metod for the case study.

Reliable measurement results were achieved using large number meters and pressure transducers installed in the pumping stations. Power consumption for each pump was recorded from the two kW meters having high accuracy. After the completion of measurements the characteristic of the pumps. Hence analicys of existing joint pump response and water mains and also referring to
ACC conditions (water with drawal before pumping station HC2 with consumptions 1600m3/h being given to treating facilities OBC and city containers, and also precatory DVC on 1 stage will limit with minimal changes in water supply arrangement offered: On pumping station 1 upturn HC1 to install instead of 1 big pump D6300-800 1 middle pump D3200-75(or similar), which will allow condition 0,5.It is recommended to change 4 or 3 pumping unit if there are no other reasons,because on preliminary measurements these pumps give less water supply with a combination with another pumps.

To connect with absorbing pipe will be needed a transition pipe branch from D600mm to pump 800mm to absorbing pipe.On the pump output will be needed a pipe branch D500mm at pump D600mm to downstream pipe if HA4 or HA3 will bw needed to be changed and to D800, if HA1 or HA2 will be changed. To assemblage of pumping unit the bottom must be rised ,so on inled pipe will not apear air places . The taken off big pump must be stored as duplicate, when one of main pumps will be repaired. Also middle duplicate not installed pump must be there, fig.2 and 3.

On the pump station 2 must be installed subsidiary small pump which gives 4 time less then main pump. As a result ,can be used condition 0,25, and the difference of consumption between conditions 0,5 on 1 rise and 0,25 on 2 rise will be selected on water purifier station DVS.To install in condition 0,25 offered existing pumps D1600-90 or 2000-100 (if necessary it is possible using surface-conditioned working wheels)which is recommended to install instead of HA6. To have reserve istalled pumps for conditions 0.5 and 0.25, is recommended instead of big HA1 to install middle pump HC , thus, in HC2 will be installed 3 big pumps, 2 middle and 1 small (reserved one can be stored not installed). For introduction of condition 0.25 on the Pump station 2A easier way is to change middle pump HA11 to one of small ones D1600-90 or D2000-100.
Then its necessary to have reserve not installed pumps of that kind.[1]

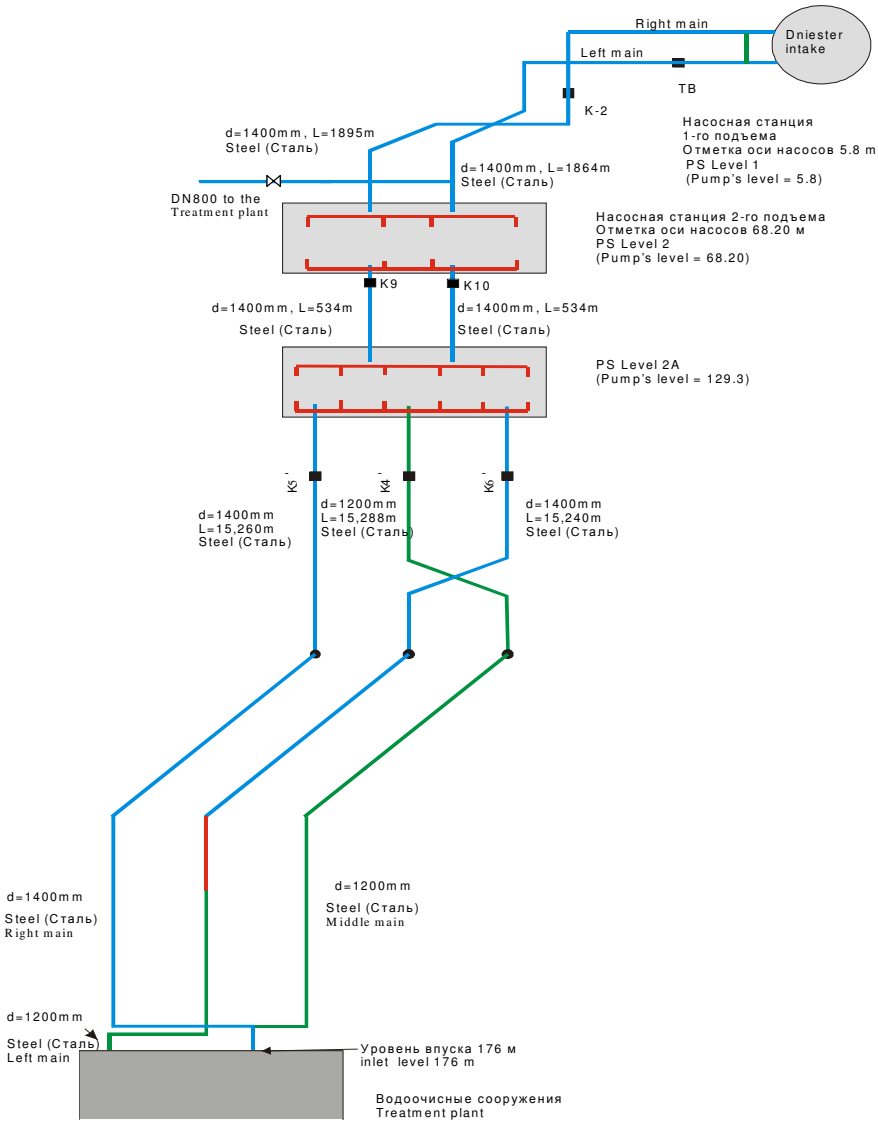


Fig.1. The scheme of pumping stations and water mains from intake r. Dniester to the Water Treatment Plant (OVS) Ciocana.

But if goal is to have installed pumps, then, keeping existing plan , could be connect additional one, or easier, two pumps D2000-100, located at left relatively to water direction, using now for clear water supply. For this its necessary to connect supplying pipeline to pumps HA1 (HC1) with pipe to inlet pipeline of those small pumps, and on outlet of small pumps its necessary to connect with a pipeline their common downstream pipeline with big pump HA2 downstream pipeline. Thus, will exist installed reserve pumps in the pump station HC2A and for conditions 0.5 and 0.25. If for some reasons it will be impossible, then small pump must be installed connected to existing outlet on the tailpipe HA10 , by installing pump unit between HA9 and HA10 and connecting outlet from small pump to one of nearest downstream pipelines. For its installation base arrangement will be needed. These offers will allow to realize following supply conditions plans on OVS: 0.5+0.25+0.25, 1+0.75+0.75, 1.5+1.25+1.25, 2+1.75+1.75, 2.5+2.25+2.25, 3+2.75+2.75, 3.5+3.25+3.25.

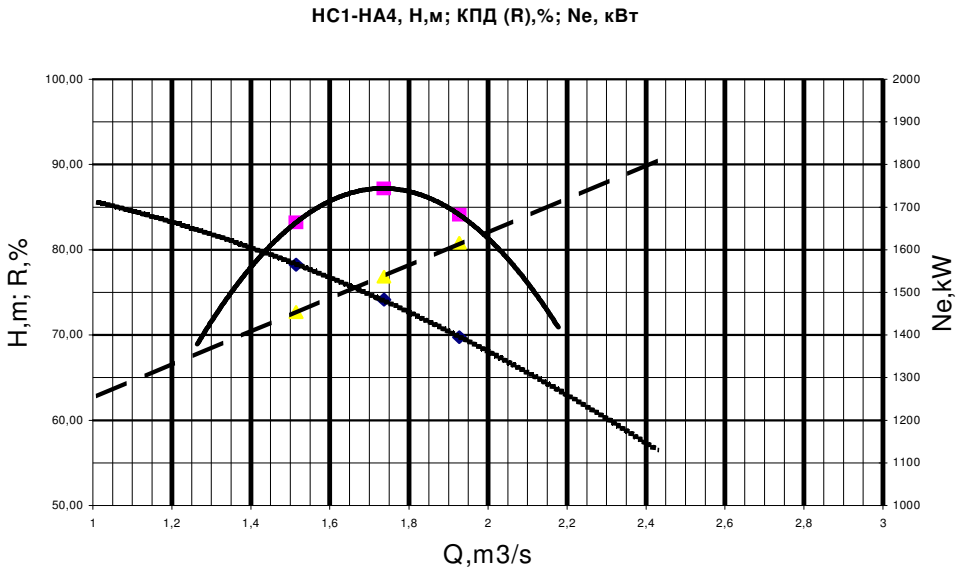
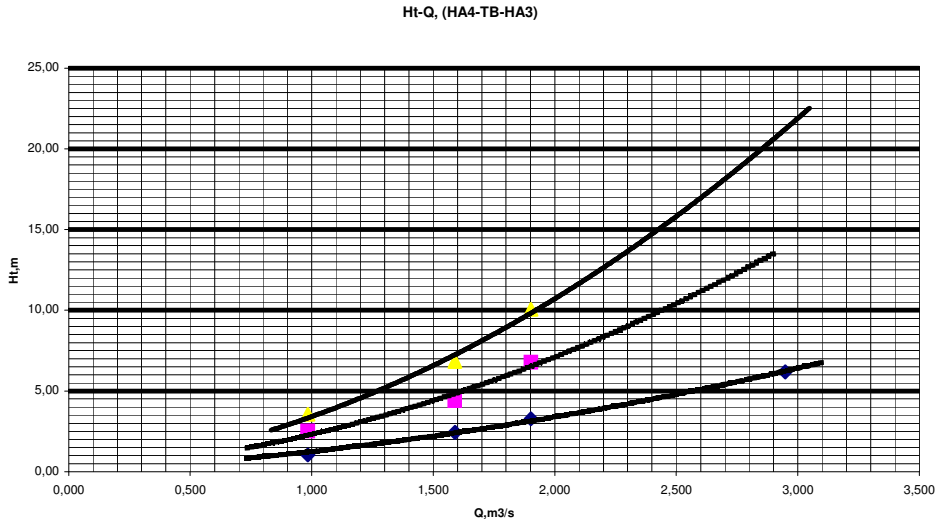


Fig.2. Characteristics curves and measured parameters for an D6300-80 pump.

To decrease loss of water pressure from HC1 to HC2 its necessary to include existing watermains D1000mm and D800mm which previously transmitted water from DVS1 and from pump station underground water scoop. Since connection between main watermain D1400mm and additional already exists D800mm from DVS1 and D1000mm from PS ungerground water scoop , its necessary to make only dam connecting D1400mm (right) with D800mm which before supplied on left line from DVS1 .



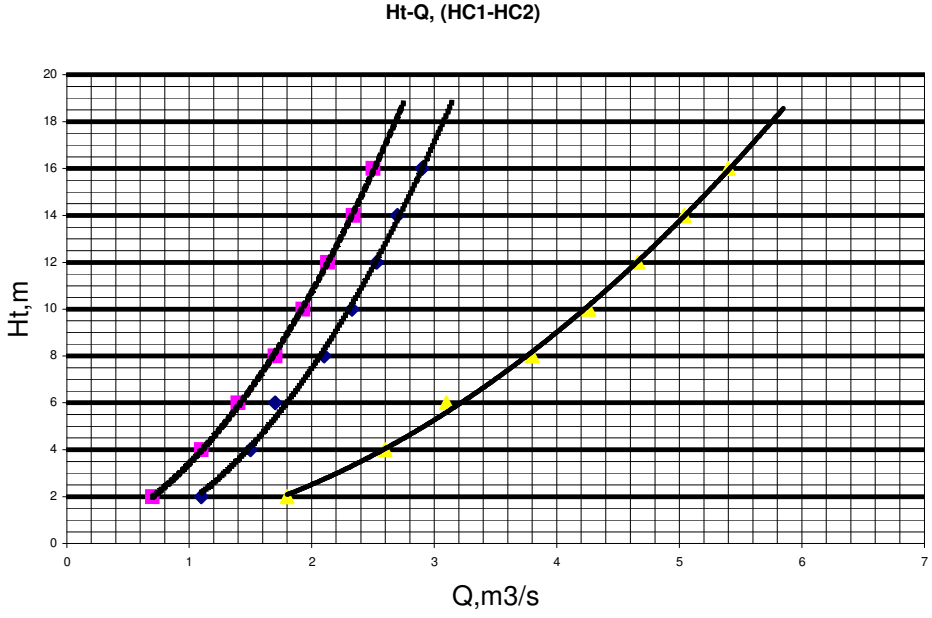


Fig.3. Characteristics curves and measured parameters for an conducts Sp1 –SP2

There is possibility to supply a part of water to treatment plants DVS using skip through collecting main of PS of underground water scoop and PS DVS1. Thus , is expecting termination of selecting of water on D800 before PS2, and vice versa , its possible coming in additional to 2 main water mains as water excess from mixing chamber DVS.

This will lead to parameters stabilization on input HC2 and will make better cavitational pumps properties and range of optimal regulation of pumps parameters.[2].

To increase supply on all water mains its necessary to arrange for decrease loss of pressure in local hydraulic resistances , turns, changes, valves(open as much as possible and max. diameter), check valves and devices for hydraulic hit discharge. Its necessary to check air valves ,to avoid air areas in higher places in water main.

During work of small number of units on PS and small geometrical heights of water supply and with existance of many water mains, can be danger of cavitation, for that its recommended to to limit a number of working , as main regulating for all pumping station and additional partial valve gate adjustmenton output of pump or redistribution of water with valve gate on collectors , to lead every pump to optimal condition meaning cavitation and performance factor.

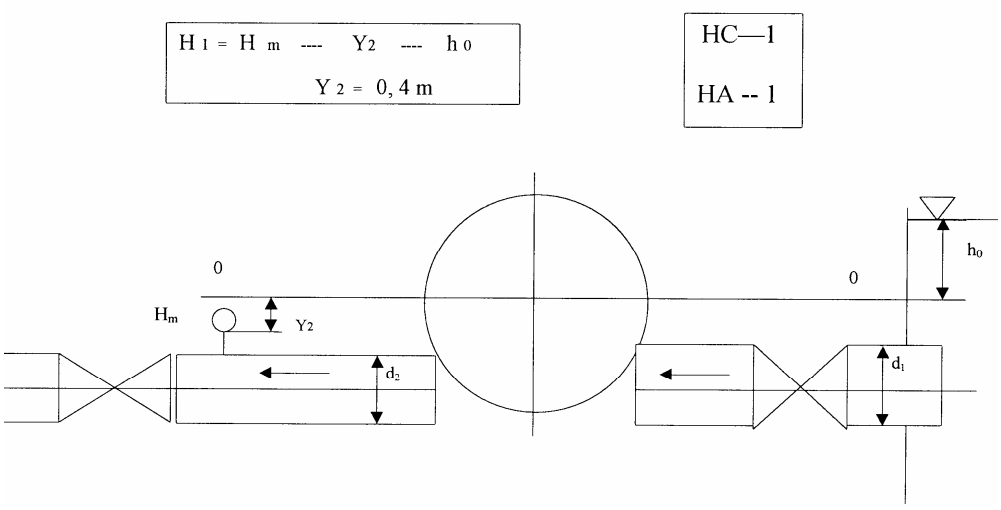


Fig.4. The circuit of installation for definition of a pressure of the pump D6300-80.

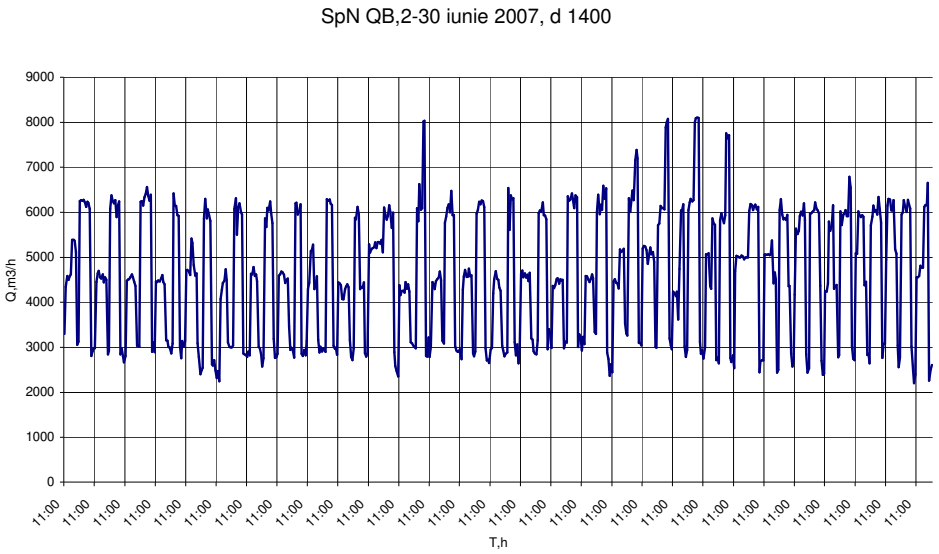


Fig.5.Variation of the charge of water in the pipeline from pump station within one month.

Supply increasing each of the pumps HC2 and HC2A is possible with a pressure on pump input lower than zero, even to -3.5 m (according to characteristic of allowed cavity margin for pumps when big inflow), thats why for work in that area is needed to install forced cool

of a gland to protect from air penetration in pump from the outside with a help of additional feeding from pump pressure piping with enaugh pressure , so water to come out from gland compactions as a thin stream durind pump work.

. Generally for better work on energetic and cavitational measures of the pump unit and also the stability of the parameters in the work process its necessary to isolate raw water supply from DVS2 on OVS using same conditions on all raisings , to make for that only one change on PS 1 , meaning instead of one big pump D6300-80 to install one middle pump D3200-75 , fig.4.

As a result we have possibility to supply raw water with plans of conditions:

0.5+0.5+0.5, 1+1+1, 1.5+1.5+1.5, 2+2+2, 2.5+2.5+2.5, 3+3+3, 3.5+3.5+3.5.

As to supplying water on treatment plants DVS , it could be supplied by pumps from DVS 1 with a partial change to D2000-100 or D1600-90 , reconstructing intake pipes , so when level of river Dnestr is low, pump filling is going by gravity flow from settling tank lake only to start pumps or to use system vacuum.

As one of variant could be installation of pump D2000-100 or D1600-90 on floating pump station additionally installing empty pipes pontoon and connecting pressure line with the pressure water mains from PS DVS1 or to pressure mains PS underground waterscoops. This will allow to work independent for treatment

plants DVS, but it require additional maintain costs, because additional personnel maintaining station appears. Pressure loss will be lower if water will be supply by 2 water mains D800 mm and D1000mm to DVS.
In pump units maintaining is recommended to look after work condition of a pump by the pump inflow, pressure devices on water and pump output for estimation of value of pump pressure takin into account speed pressure, electric motor power, thus, to make power factor close to 1. In case if on input in pump pressure will be lower than atmospheric, its necessary to estimate if pump is working in cavitation condition. In case if there are 2 or more pumps on 2 or more water mains , estimation of work of each of them can be defined starting from common inflow on watr mains takin in account input and output of pump pressure measuring device results., defining pump pressure taking in account speed pressure , and also device allocation relatively reference plane (axis of pump) and also by electric parameters is needful fo calculate electric motor power and value of power factor.
By display difference of the pressure devices on pump output and on input of water mains and water supply in present condition can be estimated the pressure loss oh these sections and hydraulic resistances.

3. Conclusions.

One of decision to improve energetic and maintenance indexes is installing in pumping station1 a raising DVS2. except pump with condition 0.5 instead of big pump , pump with condition 0.25 (for instance, D1600-90 or D2000-100, can be with surface-conditioned wheels). It will allow to introduce conditions on HC1 from 0.25, 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75, 3, 3.25, 3.5, 3.75, they can be necessary if small volume of regulating capacity. To assemble this unit connect it parallel to one of already installed pumps, but these changes will need base arrangement.

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